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Congratulations

When, in 1896, a group of enthusiasts created the American Foundrymen's Association, they did more than provide an organisation for the collection and dissemination of technical knowledge, they gave a new significance to the word " foundryman." Before this date, though the word existed in the United States, it was virtually obsolete in this country. We are not, and never have been, particularly enamoured of the word, but we are conscious of the fact that where constant usage is invariably directed in a decent and respectable sense, time will accord it the status so gained. Thus for 50 years the American Foundrymen's Association, with which body we have been proud to be associated for a quarter of a century, has constantly added lustre to the escutcheon of the industry. It was the prototype upon which the Institute of British Foundrymen was built. Co-operation between the organisations has been continuous since the late Mr. A. O. Backert, the then president of the A.F.A., visited this country in 1919. The next year saw at the Blackpool Convention the presentation of the first American Exchange Paper, and every year since that time this excellent system has continued. Realising the benefits to be derived from the organisation of Branch activities, the A.F.A. emulated the Institute in 1934. So great a success has followed its launching that the total membership is now over 8,000.

The British foundry industry is greatly indebted to American enterprise. To its credit must go many major developments in mechanical moulding and sand control. Modestly, we express the opinion that if we have not been particularly outstanding as creators of foundry developments, we have at least been apt pupils. Between the two wars, many of the presidents and high officials paid visits to this country, and the personal contacts so established have proved to be of the greatest value in oiling the wheels of co-operation during the last war.

The Conference held in Cleveland was of truly gigantic dimensions, the attendance being of the order of 20,000. The Mayor of Cleveland officially designated this manifestation as " Foundry Week," and we doubt if ever the inhabitants of any city in the world have ever been made so conscious of the importance of our industry. National recognition of the importance of the event was given by the receipt of a telegram from President Truman. It is a matter of regret that the celebrations came at a time when the aftermath of war with its paucity of transport, currency restrictions and rag-bag wardrobes, limited international co-operation to the minimum. However, the " token " delegation, headed by Mr. T. Makemson adequately expressed the sincere admiration felt by European foundrymen for the enterprise and energy which has placed the American Foundrymen's Association on the highest level amongst co-operative technical efforts.

The time is appropriate to express the gratitude of the foundry world to those two great pioneers Dr. Moldenke and Mr. John A. Penton, who possessed the vision to realise that there existed a need for an organisation which would plough science into their industry. A fertile field resulted, and from its seeds the world's factories have gained immeasurable benefits.

The A.F.A. is now directed by a virtually new staff. " Bob " Kennedy, and " Jane " Reiniga have retired, whilst Mr. Hoyt restricts his activities to the " Foundry Show." To them and their successors go our best wishes. To the members, President and Council of the American Foundrymen's Association we send our heartiest congratulations on the culmination of fifty years of honest and enlightened service to a worthwhile basic industry.

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INTERNATIONAL NICKEL COMPANY

AMERICAN LAW CASE

The American company associated with The International Nickel Company of Canada, Limited, together with its principal officers, is being subjected to a legal process under the Sherman Anti-trust Act. In this connection, Mr. R. L. Beattie, vice-president and general manager of the Canadian company, has issued a statement of which the following is an abridged version:—

In connection with the civil anti-trust proceedings against the company announced by the United States Department of Justice, and being instituted in the Federal Court in New York, we have not been served with a complaint in the proceedings against the company, but from the reports we have it appears that the United States Department of Justice is attempting to deprive The International Nickel Company of Canada, Limited, of its United States subsidiary. The complaint seems to be that because the nickel mined in the Dominion is purchased by a large percentage of the United States nickel users, the company is to be classed as a monopoly illegal under United States law. The firm's nickel is in active competition with the production of other producers including that of the United States Government itself from the Cuban deposits, and also it is in competition with many other alloying elements. The prices charged by the company in the United States have been so low as to require the United States Government to give, during the war, substantial subsidies to the company's competitors. The concern's nickel all comes from a small area in Ontario next door to the United States market, but there are vast nickel deposits owned by others in many parts of the world.

No Agreement with Competitors

The company has no agreement with any of its competitors which prevents their competing with it in the sale of nickel in the United States market or elsewhere. Its position in the industry is the result of engineering and metallurgical leadership and of unceasing research over half a century to create new alloys of nickel and to expand uses for them.

The sole plant of International Nickel in the United States consists of a rolling mill at Huntington, West Virginia, and represents barely four per cent. of the company's total plant property. Although it accounts for only a small percentage of world nickel sales, it has promoted the production, export and usefulness of Canadian nickel by serving over the past quarter century as the mainspring in the development of high nickel alloys. This is a service to industry and to the United States Government, which only a producer of the raw material could have the incentive to render. This pioneering has helped American industry to make better products for many thousands of industrial and household applications. Finally, Mr. Beatty expressed confidence that the United States courts would vindicate the company completely.

A.F.A. GOLDEN JUBILEE CONGRESS

Some 20,000 foundrymen attended the 50th annual congress of the American Foundrymen's Association, held early this month in Cleveland, Ohio. An exhibition of foundry equipment was an added attraction. The congress was presided over by Mr. F. J. Walls, of the International Nickel Company.

After the business meeting held on May 9, Mr. Sheldon V. Wood was elected president for the 1946-47 session. Mr. Wood is president and general manager of the Minneapolis Electric Steel Castings Company. Mr. Max Kuniansky was chosen as vice-president. His technical achievements have received international recognition. Mr. T. Makemson, M.B.E., the secretary of the Institute of British Foundrymen, voiced the European foundry organisations' congratulations to the A.F.A., and pointed out that it must have required unusual courage and vision to create the pioneer foundry technical organisation.

1946 Foundation Lecture

Dr. G. H. Clamer, president and general manager of the Ajax Metal Company, delivered the 1946 Foundation Lecture on the subject of "Test Bars for 85:5:5:5 Alloy." His subject matter was basically a study of the limitations of test bars. He pointed out that through a study of these limitations it was hoped to find means of establishing better test bars. His lecture also covered the effect of melting practice on metal quality as indicated by test bars.

Banquet

The chief guest at the banquet was Brigadier-General D. Armstrong, commandant of the Army Industrial College, Department of Research, Washington. His speech carried the caption "The Foundry in War and Peace." The banquet also saw the presentation of gold medals to Mr. Howard F. Taylor, Mr. Peter Blackwood, of the Canadian branch of Ford's, who was trained at the Royal Technical College, Glasgow, and Mr. Hyman Bornstein—a past-president. Honorary life membership was accorded to Mr. Harold J. Roast, of the Canadian Bronze Company, Limited, and Mr. W. J. Coane, of the Ajax Metal Company, Philadelphia.

Re-establishment of International Committee

There was an informal meeting the the representatives of the foundry associations of Britain, Czechoslovakia, France, Holland, Belgium and the U.S., to discuss means for the re-establishment of the International Committee of Foundry Technical Associations. As a result an effort is to be made to have the friendly nations who were affiliated with the Committee before the war appoint an official representative to attend a meeting to be held later this year. Such a committee would—as in the past, arrange for the exchange of technical papers, establish a calendar of international gatherings, and other pertinent matters.

A NEW high-speed, multi-spot resistance-welder control unit of American origin permits automatic assembly welding rates of up to 900 spots per min.

SOME CASTING TROUBLES*

By J. L. FRANCIS, A.M.I. Mech. E.

Oftentimes those responsible for the production of castings gain the depressing idea that trouble is concentrated in their particular foundry alone, whilst in others a waster is seldom ever seen. This Paper will show unsatisfactory castings to be confined not to any one foundry, nor to any single casting alloy. Its object is to indicate the cause of the faults described and to suggest how their repetition may be avoided.

Each example is from a different foundry, and cast iron, non-ferrous and light alloys are represented. Some types of defect are common to all cast metals, whilst others, if not exclusive to one particular class, are certainly more prevalent in it.

Causes of Defective Castings

Most of the causes of defective castings can be classified under six main headings:—(1) Wrong alloy composition; (2) unsatisfactory melting technique; (3) unsuitable moulding or core sand; (4) incorrect pouring, gating and feeding practice; (5) poor design; and (6) bad workmanship in moulds or cores, or errors in assembly. These are, apart from such obvious faults as damaged moulds and cores, short and careless pouring.

FIG. 1.—SHOWING NEEDLES OF IRON-RICH CONSTITUENT IN L.33 ALLOY AT 25 MAGNIFICATIONS. THE STRUCTURE IS COARSE AND UN-MODIFIED.

*A Paper presented to the East Anglian section of the London branch of the Institute of British Foundrymen.

Wrong Alloy Composition.—Material very susceptible to trouble from this cause is represented by the aluminium-silicon alloys of the D.T.D. 424 and L.33 types. The former is specified to contain from 3.0 to 6.0 per cent. silicon, and the latter is the eutectic alloy with silicon between the limits 10.0 to 13.0 per cent. These are both secondary alloys and allowed to contain 0.7 per cent. manganese, 0.8 per cent. iron and 0.5 per cent. manganese, 0.6 per cent. iron respectively, the figures being maxima in both cases.

FIG. 2.—SHOWING WELL-MODIFIED STRUCTURE OF L.33 ALUMINIUM ALLOY AT 150 MAGNIFICATIONS.

In order to obtain fine-grained, pressure-tight castings, it is necessary to refine or modify the aluminium-silicon constituent with sodium. Furthermore, if modification is not effected, the specified mechanical properties cannot be achieved. Modification is easily accomplished provided chemical composition is maintained within the specified limits, and this applies particularly to the manganese and iron contents. Both must be present in about equal quantities to maintain the required balance. It is easy, however, to pick up iron during melting and, when the iron predominates much over the manganese, the normal mechanism of modification is adversely affected.

Fig. 1 shows an L.33 alloy which contained as much as 1.9 per cent. iron and only 0.07 per cent. manganese. Here, an iron-rich constituent is seen in the structure in the form of long needles, the effect of which has been to prevent modification of the aluminium-silicon eutectic, seen in coarse particles in the background. A properly modified structure is shown in Fig. 2, and here

Some Casting Troubles

the alloy contained manganese and iron well within the specified quantities.

Apart from failure to pass the stipulated mechanical tests, lack of modification is a cause of the kind of concentrated shrinkage shown in Fig. 3.

Another kind of defect resulting from unsuitable composition is shown in the photograph of a bronze bush casting (Fig. 4). Here the alloy contained as impurity 0.25 per cent. aluminium and showed the typical silvery casting skin. The inclusions in the casting are chiefly oxide dross and films formed from the aluminium. Factors also contributing towards the defect in this case were too low a pouring temperature and lack of deoxidation.

Unsatisfactory Melting Technique

There is, perhaps, no metal more sensitive to melting conditions than high conductivity copper, largely because of its high solubility for gases when molten, particularly oxygen and hydrogen.

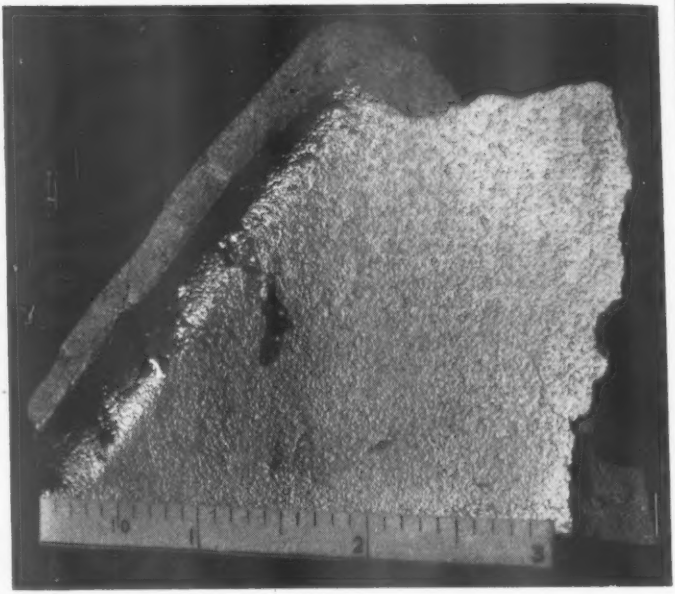


FIG. 3.—PORTION OF CASTING IN L.33 ALUMINIUM ALLOY SHOWING CONCENTRATED SHRINKAGE DEFECT DUE TO UNMODIFIED CONDITION.

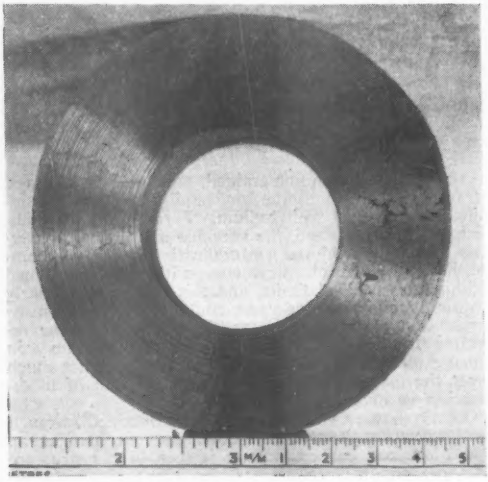


FIG. 4.—BRONZE BUSH CASTING SHOWING INCLUSIONS OF OXIDE AND DROSS ARISING FROM ALUMINIUM CONTAINED AS AN IMPURITY.

Oxygen combines to form cuprous oxide, and the dissolved hydrogen is expelled as the temperature falls and the metal freezes. As the hydrogen is thrown out of solution, it reacts with the cuprous oxide to form water vapour, the so-called "steam reaction." This sets up a vigorous disturbance in the metal in the mould, resulting in serious unsoundness of the type shown in Fig. 5.

To avoid the trouble illustrated, high conductivity, and to a lesser extent, commercial coppers, should be melted down under the protection of a reducing flux to limit the formation of cuprous oxide. Then, by finally deoxidising strongly with appropriate reagents, oxygen is reduced to a minimum so that little remains to combine with hydrogen. It then follows, provided hydrogen is not present in excess of solid solubility, that sound castings will be produced. Use a fast melting furnace and during the early stages of melting introduce about 1 per cent. of the charge weight of a suitable reducing flux. The slag cover provided by the flux should, so far as possible, be left intact as a protection to the melt until a temperature of about 1,200 deg. C. has been reached. The precise maximum temperature to which the charge should be raised depends upon the weight and thickness of the castings concerned. Generally the temperature should not exceed 1,250 deg. C. at any time during melting. An average pouring temperature is about 1,150 to 1,180 deg. C.

FIG. 5.—GAS POROSITY IN AN INGOT OF COPPER RESULTING FROM THE REACTION OF HYDROGEN AND CUPROUS OXIDE.

About 2 or 3 min. before pouring, some deoxidation treatment is essential. Various deoxidisers have been advocated for copper, but where high electrical conductivity is required, the choice is limited. Phosphorus, which is employed extensively for the purpose with copper alloys, is not advised. Although it will deoxidise efficiently, a residue of 0.05 per cent. remaining in the melt will reduce the conductivity by 30 per cent. Other commonly used deoxidants possess a similar disadvantage, but calcium gives the desired result.

During the pouring of the castings, the metal stream should be dusted with powdered charcoal to protect it from the oxygen and hydrogen in the atmosphere. The charcoal must be moisture free, and this applies equally to all tools, fluxes, crucibles, etc., used in the melting process. A further important point in connection with high conductivity copper castings is that iron pick-up from stirring and skimming tools should be guarded against. Iron to the extent of 0.2 per cent. reduces the electrical conductivity of copper by 50 per cent.

A further example of unsatisfactory melting technique is afforded by the aluminium casting depicted in Fig. 6. The extensive pinhole porosity is typical of many cases in which the alloy has been raised to too high a temperature and held there for too long, without adequate protection from the furnace gases. Aluminium based alloys absorb hydrogen very rapidly at temperatures above 760 deg. C., so a strict temperature control is very necessary. Melting should be conducted along the following lines:

Charge the ingot and scrap together with about ½ per cent. by weight of a suitable flux. By suitable flux is meant one which will melt and form a cover on the surface of the bath, protecting it from the furnace atmosphere, and at the same time exert a cleansing action on the alloy, dissolving oxides and floating non-metallic impurities to the surface.

When the complete charge has reached a temperature of approximately 700 deg. C., the source of heat should be shut off, and during the ensuing temperature rise a degassing operation carried out. Degassing is accomplished in several ways, among which are, passing a stream of dried nitrogen, or chlorine, through the melt, and the plunging of organic compounds which evolve chlorine. Actually passing gas is rather inconvenient, as it necessitates the use of cylinders, pressure regulating gear and piping. When chlorine gas is used, special precautions are needed with respect to adequate ventilation. For speed and convenience, organic degassers which can be plunged, are hard to beat. They also have the added advantage that grain refining elements such as boron can be incorporated in their make-up, thus obtaining a degassing and grain refining action in the one operation.

Upon the termination of the degassing reaction, the melt should be left standing quietly for a few minutes. Then add a fresh covering of flux and stir well into the surface area. This helps to separate the oxide and dross from the alloy, thus ensuring relatively metal-free skimmings. The melt can then be skimmed and the moulds poured.

FIG. 6. — EXTENSIVE PIN-HOLE POROSITY IN AN ALUMINIUM ALLOY CASTING RESULTING FROM ABSORPTION OF HYDROGEN DURING MELTING.

C

Some Casting Troubles

Unsuitable Moulding or Core Sand

Sometimes it is difficult to distinguish between gas taken up during melting and that derived from the mould or cores. Fig. 7 depicts a section of a casting in L.33 aluminium alloy. In this case the porosity was considered due to the moulding sand having too high a moisture content and being insufficiently permeable. Ramming too hard and excessively hard cores can produce a similar effect and so can a damp pouring ladle.

Wrong kind of sand is also largely responsible for the defects shown in Fig. 8, which is a cupro-nickel casting. There is little doubt that the cavities are caused by gases evolved from core or mould faces. Tests made on a sample of the sand showed the A.F.A. permeability to be 27, with 2.3 lb. per sq. in. green compression strength. Moisture was 10.8 per cent. and the clay substance 7.7 per cent. In view of the low green strength and bond ratio, working would be difficult and to overcome this, hard ramming would most likely have been employed. Hard ramming coupled with the already rather low permeability would decrease the venting properties even further, with results as shown.

An example taken from the ferrous field is shown in Fig. 9, which illustrates a portion of a cast-iron flanged pipe. Blow-holes are clearly seen in the bore, and, as shown by Fig. 10, they penetrate completely through the wall of the casting. The sand used

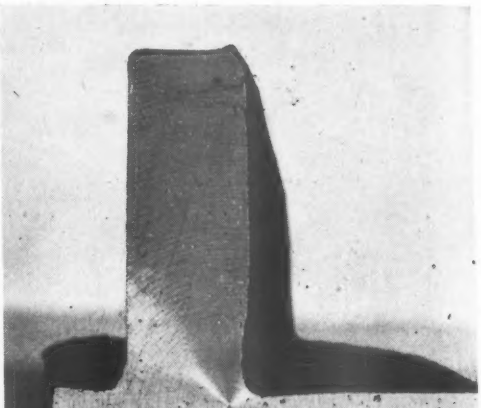


FIG. 7.—SECTION OF CASTING IN ALUMINIUM ALLOY L.33 SHOWING POROSITY ATTRIBUTED TO EXCESSIVE MOISTURE AND LACK OF PERMEABILITY IN THE MOULDING SAND.

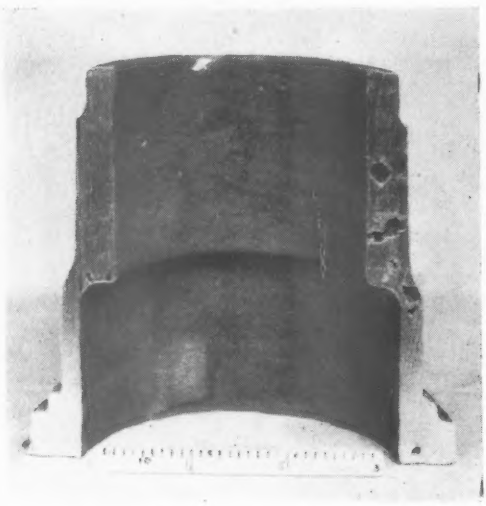


FIG. 8.—CUPRO-NICKEL CASTING SHOWING CAVITIES FORMED BY TRAPPED GAS FROM THE FACE OF THE MOULD OR CORE.

in moulding these castings had a clay substance of 21 per cent., which is unusually high. Furthermore, the clay was not uniformly distributed throughout the mass of the sand as an envelope round each sand grain. In other words, no efficient milling of the sand had been carried out. Consequently there were localised patches where the clay concentration was even greater than 21 per cent. At these spots the permeability would be almost nil and, moreover, wherever they occurred at the mould face, the metal would not lie quietly, resulting in the type of defect portrayed.

Incorrect Gating and Feeding

Much can be done towards the production of sound castings by a study of proper running, gating and feeding methods. One of the main considerations is to arrange for progressive solidification, and this applies equally to all forms of castings, no matter from what metal or alloy they are made. The first metal to enter the mould should be directed to the part furthest from the gate or gates. In traversing the mould surfaces it loses some of its temperature and sets soon after reaching the end of its journey. Following metal does likewise, and, with ideal conditions, solidification proceeds gradually towards the gates and feeders. These, containing the last metal to enter the mould, should remain liquid long enough to supply the needs

TABLE I.—*Approximate Shrinkage from Pouring Temperature to Freezing Temperature of Some Casting Alloys.*

	Liquid Shrinkage, Vol. per cent.
Soft grey iron, 3.5 to 4.0 per cent. T.C.	0.6
Aluminium alloy (11 to 13 per cent. Si)	3.5
Copper (deoxidised)	3.8
Aluminium bronze (90 per cent. Cu, 10 per cent. Al)	4.1
Grey iron (3.0 to 3.25 per cent.) T.C.	4.2
Manganese bronze, 40 per cent. Zn; 1.25 per cent. Fe; 1 per cent. Al; 0.5 per cent. Mn; 0.5 per cent. Sn	4.6
Grey iron, high test, 2.5 to 2.75 per cent. T.C.	5.0
Nickel silver, 20 per cent. Ni; 15 per cent. Zn; 65 per cent. Cu	5.5
Ni-resist austenitic cast iron	5.6
White iron, chill cast	5.75
Nickel (98 per cent. Ni; 1.5 per cent. Si; 0.1 per cent. C)	6.1
Monel (1.0 per cent. Si)	6.3
Yellow brass (27 per cent. Zn; 2 per cent. Pb; 1.0 per cent. Sn)	6.4
Nickel silver (2 per cent. Ni; 15 per cent. Zn; 4 per cent. Sn; 5 per cent. Pb)	6.5
Aluminium rich alloys not containing Si	6.5 to 8.0
Steel	7.22
White iron malleable	7.25
Bearing bronze, 10 per cent. Sn; 10 per cent. Pb	7.3

of solidification shrinkage, much of which will have occurred during the period of pouring if the dimensions of the running system are correct.

Many castings of complicated shape do not readily lend themselves to a straightforward means of obtaining directional solidification, and where bosses or thick sections are located at places shut in by thinner sections, cooling may have to be accelerated artificially by means of denseners. Conversely, it is also possible to extend the period over which thin sections remain liquid by the judicious use of heat insulating pads. Another important point for consideration is the proper balancing of the feeding system, especially where more than one feeding riser is in use. As soon as the surface skin of a feeder has set, subsequent feeding, if any, takes place by the action of gravity. If, at the same time, other feeders on the casting are still liquid at the surface, they are under the combined action of gravity and atmospheric pressure. Under these conditions the feeder which sets first at its top may be fed by those remaining open to the atmosphere and unless they are adequate to do this as well as feed the casting, the result is a solid feeder with shrink holes below it. Feeding powders which help to maintain the metal in feeders liquid over longer periods, and the use of atmospheric cores are of definite assistance in securing balanced feeding conditions. Besides all this, feeding risers and shrink bobs must be designed properly if fully fed castings are to result. In all cases, the connecting necks must be short, not much over 1 in. in length. Under these conditions the diameter of the connection can be considerably reduced and subsequent removal of the feeding head is greatly facilitated. For example, it is possible to feed a 6-in. dia. section by a 10-in. dia. feeder through a 3-in. dia. connecting neck, provided the neck is not more than 1½ in. long. Combined runner-riser systems are particularly effective where they can be applied since all the molten metal enters the mould *via* the feeder, thereby getting this thoroughly hot before it finally becomes filled with the hottest metal in the casting.

Table I gives some approximate values for the liquid shrinkage, expressed as volume percentages, for a number of well-known casting alloys. These cover the range from liquid alloy at average pouring temperature down to the temperature at which freezing occurs, including the freezing shrinkage. Fig. 11 shows a typical defect resulting from liquid shrinkage due to lack of feeding in an 88/10/2 gunmetal casting.

Common among other types of defect caused by unsuitable gating practice are dross and oxide inclusions in the castings. Also, entrained air and sand particles

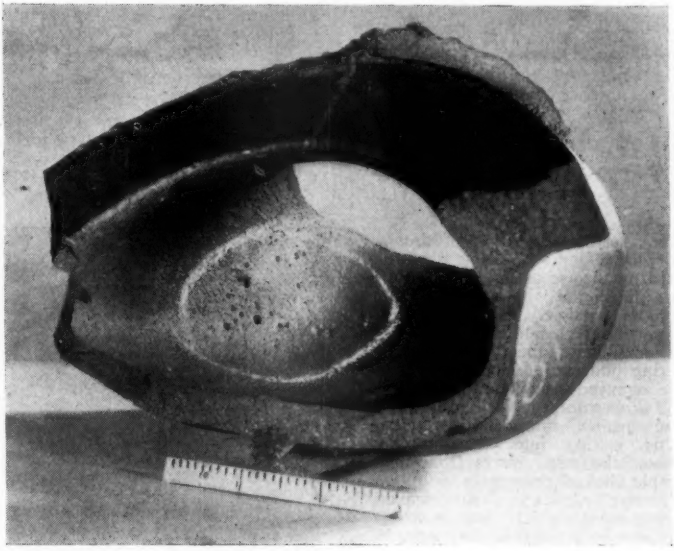


FIG. 9.—BLOWHOLES IN THE BOKE OF A CAST-IRON PIPE DUE TO EXCESSIVE CLAY CONTENT OF THE SAND.

Some Casting Troubles

arising from turbulent pouring. Alloys such as aluminium bronze and manganese bronze are especially prone to the formation of dross. For these, bottom gating is standard practice so as to get the alloy into the mould with as little agitation as possible. For the same reason, ladles are held as closely as possible to the runner basin, during pouring. Runner systems are arranged to include dross traps and skim gates as a further precaution against non-metallic inclusions getting into the mould. These take many forms from the simple choked down gate to quite elaborate designs. A simple arrangement which has proved effective in practice is the stepped gate shown in Fig. 12.

Light alloys of aluminium and magnesium also are liable to produce castings containing dross and oxide unless special care is exercised in melting and pouring. With these the tendency is even greater because their specific gravity is low and little different from that of the dross and oxide itself. Thus there is small tendency for the oxide to disentangle itself from the metal. Here, too, turbulent pouring must be prevented as it is a major cause of a kind of defect brought to light by X-ray examination.

FIG. 10.—SAME CASTING AS FIG. 9, EXTERNAL VIEW SHOWING PENETRATION OF THE BLOWHOLES THROUGH THE WALL OF THE CASTING.

Too slow pouring causes cold shuts and drawing down of top parts. With large flat mould or core surfaces, gating must be arranged so that the area is covered progressively by the molten metal. Where it is allowed to pass over, recede and flow back again, a tendency to form "buckles" or "blacking scabs" is set up. Such a defect is shown in Fig. 13.

Poor Design

Much that has been said respecting controlled directional solidification is tied up with design. To obtain the maximum degree of success it is necessary that certain principles of casting design be adopted. Abrupt and exaggerated changes of section, indiscriminate ribbing, internal bosses and heavy bosses joined by thin walls, all militate against progressive solidification and make it more difficult to produce a fully fed sound casting.

Theoretically a greater metal thickness gives more strength. With castings it does not always work out this way. Thick sections tend to cool more slowly and even if free from draws and porosity, the

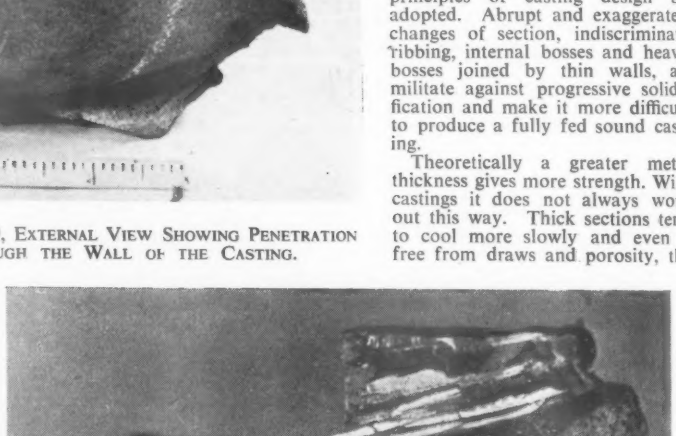


FIG. 11.—SHRINKAGE DEFECT DUE TO LACK OF FEEDING IN 88-10-2 GUNMETAL ALLOY.

structure is of larger grain size and the mechanical properties at these areas are less. Where defects are present as well, the strength may be below that of the thinner parts and thus the whole purpose of providing extra metal may be defeated.

A few simple examples of improvements which can be made in design are illustrated in Fig. 14. Rib junctions, as shown at A, are a common feature. The thickened section arising from this design is indicated by the shaded circle. Better alternatives are shown at B and C, where the metal thicknesses are much more uniform. Using the areas of the inscribed circles, a method suggested by Heuvers, as a means of demonstrating section influence, it is seen that the accumulation of metal in the design at A is 100 per cent. greater than at B or C. Similarly at D and E, the latter shows an improvement equal to a reduction in area of 80 per cent. At F a further method of reducing the tendency towards the formation of hot spots and shrinkage cavities is seen. Internal and external radii at corners should be measured from a common centre as shown at H. Extra thickness which results from the construction outlined at G may induce a shrinkage defect. In any case, the strength will be less than at H because of the line of cleavage between the crystals due to cooling conditions at the relatively sharp corner.

Diagrams I and J illustrate a further point in connection with changes of section. The abrupt change as at I is a source of weakness in view of the stress concentration likely to occur at the sharp corners. Also it encourages the formation of a hot spot by overheating the sand at those corners during casting. Small cores, almost surrounded by relatively thick metal, re-entrant angles and slim pockets which involve projecting the sand surface into the heart of the casting are all to be avoided where possible. Not only are they more trouble and expense to mould, but the sand in such cases attains to the temperature of the metal, delaying its rate of cooling and evolving gas which is often trapped in the adjacent walls of the casting.

Bad Workmanship in Moulds or Cores or Errors in Assembly

Many troubles spring from these sources and can be avoided by taking care and consideration. Common, on the list, are crushes, mis-matching, misplaced cores, blocked and omitted vents, runs out due to runners placed too near the side of the box, careless mending and patching, over-baked cores, badly placed studs and chaplets, and so on. All foundrymen experience such happenings at one time or another, and generally it is easier to ascribe a cause than to get acknowledgment from the individual concerned.

Cores are to a large extent responsible for the defective iron cylinder head casting, shown in Figs. 15 and 16. Extensive holes, cavities and disturbed metal, caused by trapped gases, are seen on the cope side of the casting. In this case the coring is complicated, the cores being covered by metal with limited means available for escape of the gases. From the way the casting is moulded, vents from the jacket core must be carried through the bottom of the mould which is a disadvantage in so far as it is against the natural tendency for gas to escape in an upward direction. Furthermore, it can be seen that the cores fit loosely into the prints, possibly due to rubbing too much away to get an easy fit. Consequently, molten iron has been able to penetrate into the prints and form a fin or flash, thereby impeding the exit of the gases from the few places where their escape should have been allowed to take place as easily as possible.

FIG. 12.—RUNNER WITH STEPPED GATE ACTING AS A DROSS TRAP.

As the design of the casting is not compatible with the provision of top and bottom core prints and a direct method of venting the gases through the top part, particular care and attention must be given to the only means which are available. Vents should be taken off from all the prints where it is practical to do so. The vents in the cores themselves could well have been larger than ¼ in., and a direct passage from the vent in the print to the outside of the casting ought to have been provided. Where vents emerge on the underside of a mould, provision should be made

Some Casting Troubles

so that the gases can escape readily from the bottom of the box, that is to say the box should be raised slightly from the floor and not firmly embedded into the sand.

Conclusion

In recent years metallurgical knowledge concerning the proper melting and treatment of molten metals and alloys to obtain better physical properties and sounder castings has increased enormously. Generally, improvements are based on control of variables and methods of working based on correct principles.

Expert supervision is needed at all stages of manufacture. Such control implies the expenditure of effort and money which is more than recovered in the higher yield of sound castings. Lack of the necessary control results in losses which can easily be heavy due to time lost in moulding and machining waster castings, with maybe loss of reputation and orders as well. To put it briefly, it is unreasonable to expect high-class work capable of meeting modern requirements from obsolete practices and methods which neglect to take advantage of up-to-date practice and achievements.

The Author records his appreciation of the facilities and permission given by the directors of Foundry Services, Limited, which have made possible the presentation of these notes.

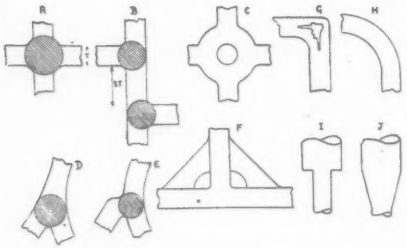


FIG. 14.—MODIFICATIONS IN DESIGN TENDING TOWARDS SOUNDER CASTINGS.

DISCUSSION

MR. KAIN, in opening the discussion, thought that in view of its extreme importance, the fifth item on Mr. Francis's list of causes of defective castings—that of poor design—warranted a place nearer the top, if not in fact at the top of the list. He was interested in

FIG. 13.—SAND BUCKLE ON THIN-SECTIONED IRON CASTING HAVING A LARGE SURFACE AREA.

the process of modification of the light alloys and would be glad if Mr. Francis would enlarge on its mechanism. Regarding the phrase re-entrant angle, he felt that as this was purely a foundry term unfamiliar to designers and others, some better phrase might be designed for it. He did not fully concur with the Author's opinion that all prints from cores should be open to atmosphere. This was not common practice, as usually one or two prints were blocked off, and the air taken off from the remaining print only, as with, for example, a three-way pipe. He had occasion to believe that an explosion might occur in striking off the air and gas as Mr. Francis suggested.

MR. FRANCIS, in reply, said that the order in which the defective causes were arranged had no significance at all, otherwise they would certainly have been different. The modification of Al-Si alloys is a process analagous to inoculation in cast iron. The sodium or sodium-bearing flux has some refining effect on the coarse Al-Si eutectic, but, like inoculation, the exact mechanism is not known, although there exists a number of opinions. The modification by metallic sodium should be carried out with care, as the sodium, as a

result of its usual submergence in paraffin or mineral oil, is apt to introduce gas to the metal. New Al-Si ingots were invariably received already modified, but he recommended in the case of a mix of new ingots and batch scrap, the destruction of the modified structure by degassing, followed by re-modification to a known degree. Regarding the re-entrant angle, this can be applied to any slim section or deep pocket of sand projecting into the casting. He could not dispute the fact that in some instances the closing or blocking of some vents was beneficial, but, speaking generally, by using all prints, the gas was allowed to get away with as little impedance as possible.

MR. NEWMAN (a visitor) questioned the modification of D.T.D. 424. He believed that 12 per cent. silicon was the best figure for good results from the process, and that D.T.D. 424 with its low-silicon and its zinc content would not lend itself satisfactorily to the process.

MR. FRANCIS agreed that D.T.D. 424 with its 3 to 6 per cent. silicon and 0.2 per cent. maximum zinc contents was not generally modified, but in the case of thin-sectioned castings it was beneficial to do so, if only for its help in preventing localised shrinkage.

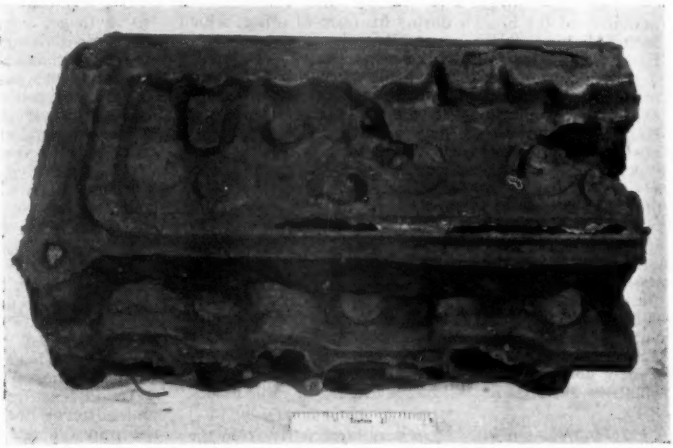


FIG. 15.—IRON CYLINDER HEAD CASTING SHOWING EXTENSIVE CAVITIES DUE TO LACK OF FREE VENTING FROM CORES.

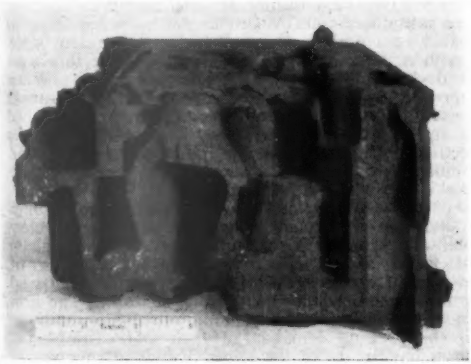


FIG. 16.—SAME CASTING AS IN FIG. 15. CROSS-SECTIONAL VIEW.

MR. R. F. COATES, although he had no questions to raise, was particularly interested in the last item in the list, that of bad workmanship. He felt that this was closely connected with training, and that if more attention was given to the correct training of apprentices, the time and trouble so taken would eventually pay a dividend in improved craftsmanship and better castings.

MR. CARRICK, in referring to the Author's remarks on "buckling," was curious to know what this implied. He himself had had trouble with similar faults, where sand buckling off had, after chipping, left a shallow V-groove in the casting. Were there any general precautionary measures which could be made to prevent this?

MR. FRANCIS, in reply, said that it was often difficult to differentiate between blacking scabs, buckle, and sand scour. Progressive flow and rising over long thin-sectioned mould surfaces, reduced the risk of such faults to a minimum.

The meeting finally very cordially responded to the vote of thanks proposed and seconded by Mr. Hammond and Mr. Carrick to the Lecturer.

THE BIRMINGHAM CONFERENCE

Members of the Institute of British Foundrymen have been somewhat tardy this year in returning their questionnaires to Manchester. To avoid disappointment it is essential that the organisers should know as early as possible members' requirements. An excellent programme—both from the viewpoint of technology and social gatherings—has been arranged, and major benefits are obviously to be obtained by full participation. The list of works visits is most comprehensive, and includes some of the foremost foundries in the country.

NOTES FROM THE BRANCHES

BRISTOL AND WEST OF ENGLAND.—A good attendance of members marked the annual general meeting, held recently at the Grand Hotel, Bristol. Mr. D. A. Richards, the branch president, addressing the meeting, expressed his pleasure with the steady progress the branch was making, and reviewed the activities of the branch during his term of office, which included nine lectures, at Bristol, Gloucester and Exeter, and also four works visits.

In conclusion he thanked the branch council and members for the way they had supported him, and he expressed his gratitude to the hon. secretary, Mr. A. Hares, without whose help it would not have been possible to have had such a successful year.

At the close of his address Mr. A. V. Biggs proposed a vote of thanks to Mr. Richards for the work and time he had devoted to the branch. This was supported by Mr. E. Griffen, and received with acclamation.

The following officers were elected for the ensuing session:—As president, Mr. A. V. Biggs; as vice-presidents, Mr. H. E. E. Holladay and Mr. J. Roskrow; as hon. secretary, Mr. A. Hares; as members of branch council, Mr. I. Rees, Mr. J. McCormick, Mr. W. J. Hares, Mr. R. S. Turner and Mr. G. T. Vicary; as branch delegate, Mr. E. Griffen; as technical representatives, Mr. B. R. Wilding and Mr. F. A. Allen.

LONDON.—On May 22, a very large party from the London branch, and its sections in East Anglia and at Slough, visited the iron and steel foundries of Lake and Elliot, Limited, Braintree, Essex. The visitors were received by Mr. C. H. Kain and Mr. John Lake, joint managing directors. The former, in a short address, extended a hearty welcome to the members, and pointed out that the foundry department entered into the "jobbing" category. This being so there were no lengthy flow lines. Instead the major part of the foundry operated by "gangs" working under a piecework system of payment. Both iron and steel were produced in the same shop, a gangway separating the two sections. The present production was of the order of 50 tons of iron and 70 tons of steel per week. The iron castings were of the light high-duty engineering type, involving generous provision of gating. The firm employs between 800 and 900, of whom 400 are in the foundry departments. The visitors were not divided into small parties, but by the aid of a map and arrows followed a set route. There was no congestion and a maximum of freedom was allowed to spend time in a shop of most interest to the individual.

The route took the visitors through the pattern shops—both wood and metal. Here it was pleasing to note that the standardised colouring of patterns was being used. Next came the department devoted to the inspection of patterns, where every opportunity was given to see the various systems of runners and risers used by the firm. Passing by the back of the cupolas, the route took the visitors through the core shop, which is mainly staffed by girl labour. Here extensive use is being made of aluminium core plates. The iron-foundry has undergone a metamorphosis since the war. The production per unit floor space has been more than doubled. All the moulding machines are new. The sand handling is largely mechanised. For steel melting there are electric arc furnaces—a new one is on order—a high frequency plant and a side blown Bessemer.

The Sandslinger plant is particularly well laid out so as to get a maximum production from the stations they serve. Ladle heating is now carried out by adapting a mechanical stoker for the purpose. It has replaced town's gas and is operating particularly successfully. The route next passed through the fettling and heat-treatment shops and terminated in the canteen, where an excellent tea was served. The thanks of the visitors were voiced by Mr. G. R. Webster, president-elect, and Mr. A. C. Turner. Mr. J. W. Gardom, the President of the Institute, also addressed the members and recalled how for two decades Lake and Elliot had given the most active support to the Institute by opening its doors to visitors and by participating fully in the conduct of its affairs. Mr. Kain suitably replied.

A FOUNDRY CENTENARY

The firm of Joseph & Jesse Siddons, Limited, of West Bromwich, was founded in 1846 by two cousins of that name. The prime concern of the business was to make cast-iron cooking utensils. The firm grew and adjacent buildings were absorbed, whilst land on the opposite side of the road was also purchased for storing packages and for enamelling muffles. So it was that a large business in enamelled cast-iron cooking utensils grew up.

In 1876, land was bought in Harvills Hawthorn, where the present works was built, and has been extended from time to time as other manufactures have been introduced. On August 15, 1881, the business was floated as a limited company under the present style, Joseph & Jesse Siddons, Limited. The directors were all descendants of the original proprietors. When improved machinery and improved steel brought pressed hollow-ware on to the market the firm launched out in that direction also. They have also entered the electrical trade, making fires and smoothing irons. Simultaneously, they have considerably developed their weighing machine department.

For the last 50 years or so the bulk of the castings produced in the foundry has been supplied to electrical and engineering manufacturers in Birmingham and father afield. When war broke out, most of the general ironmongery lines were discontinued and the firm concentrated on Government work. The firm is now gradually increasing its output of pre-war lines, but the pressing demands of their old casting customers has prevented the reintroduction of many pre-war products. The small quantity of goods which they are producing for the ironmongery trade is being shared out to old customers.

THE M.E.F. ENGINEERING COMPANY, LIMITED, is to be wound up voluntarily. Mr. C. W. S. Temple, 5-6, Bucklersbury, London, E.C.4, is the liquidator.

MASS PRODUCTION OF TANK WHEELS IN "BLACK HEART" MALLEABLE*

By A. B. BILL and J. PEERS

(*Continued from page* 81.)

Broken Moulds

In the early stages countless moulds were knocked out as unsuitable, until eventually a fixed cycle of operations was established; difficulties were met, particularly with top-part production, since it was not desirable to use lifters for several reasons. First, there is the obvious slowing up in production, resulting from the use of gaggers or lifters, and also the difficulty of their inclusion in the sand-handling plant, since obviously they could not be removed before sand is passed through the knock-out. Broken moulds, however, account for about one-third of the total rejects, and are therefore worthy of some discussion.

The term "broken moulds" is intended to cover both top parts which are sufficiently weak to break before closing and those completed moulds which collapse while travelling down the gravity conveyors. These latter are, of course, the most wasteful, since they are cast as good moulds and only revealed as wasters after knocking out. To quote Gardom again: he had a similar trouble in the Butterley plant, especially after discontinuing the use of bottom boards, and had to resort to lifters despite the use of a strong synthetic sand mixture. Not all broken moulds, however, originate from the condition of the sand. If a percentage of moulds out of a total becomes broken during transit, they must have inherent weaknesses, which admittedly may arise from an unsuitable sand mixture, but may also be caused by faulty or worn equipment, badly adjusted moulding machines or, of course, purely careless handling of finished moulds.

For example, it was found that constant jolting of the heavy cast-iron boxes indented the pattern plates. The sand joint line of a mould produced from such a plate is on a plane below the edge of the moulding box, the distance between the two being equal to the amount of indentation. Since twin plates are used and are subject to equal wear, this discrepancy is shown on both halves of the mould and is therefore doubled. When the two half-moulds are closed, the sand faces are not in contact as they should be, since the sand is below the box edges which must be together, and consequently a large area of cope is left hanging; such a mould invariably breaks before it is cast. Pattern plates are therefore built up periodically by welding at the four corners where box parts touch down, a hand electrode being used for this and any excess being ground off to leave approximately $\frac{1}{32}$ in. of clearance. This has resulted in moulds which are in contact over all the permissible area. Broken moulds from this source are eliminated and castings are free from flash, thus reducing the amount of fettling which might be necessary.

Maintenance of Moulding Machines

The correct adjustment and maintenance of moulding machines is essential for speedy and accurate production, and it would appear that the machines used are susceptible to variation in two main particulars. Firstly, a dead flat jolt is necessary, and, secondly, a smooth, level draw. Unless a perfectly level jolt is obtained, ramming is incorrect, and considerable trouble was experienced. Uneven ramming is particularly bad with a box part which has deep bars on a pattern which has parallel sides with little taper. Sand tends to have a sideways instead of downwards motion, and in extreme cases will tend to pile over to one side of the box and spill on to the floor. A speedy if somewhat elementary test has been introduced to check jolt tables, a handful of dry dust being thrown on to the table and jolting commenced; if the sand tends to creep towards the edge of the box, adjustment is necessary and made immediately.

It is important, too, that the pattern table be maintained in a truly horizontal position when rolled over, since a perfect draw is not obtained if any degree of error is present. This is checked with a spirit level as a routine check, adjustment being easily carried out. Where the pattern walls have only a few degrees of taper, as is the case with the casting produced here, a level, slow draw is essential. The draw must travel smoothly and slowly until the pattern is clear of the mould, in this case for 2½ in., otherwise the pattern will break the mould or at least disturb it sufficiently to cause a likelihood of the mould breaking when turned over. It is particularly difficult to maintain this steady draw, since pattern pins which, had they been a good fit, would ensure a straight draw, have to be machined undersize to allow for expansion of box parts as these become heated after casting.

Coring of Mould

The coring of the mould is quite a simple operation and is done, as previously stated, by females. These girls have rapidly become skilled and able to appreciate the meaning of fine limits and, moreover, are highly critical when the quality of the moulds or cores deteriorates. The centre core must be central and vertical and the position of the ball race retaining rings formed by the core correct with relation to the edge of the bore. Ample taper is allowed on the prints both top and bottom, any slight misplacement from vertical being checked as the mould is closed. A groove (Fig. 13) is moulded round the prints so that any slight core misplacement resulting in loose sand does not throw the core permanently out of position. The groove serves

*Paper presented before the East Midlands branch of the Institute of British Foundrymen, at Derby.

Mass Production of Tank Wheels

to trap the loose sand grains and to prevent these pushing the core over.

Coremaking, needless to say, has presented its own particular problems, despite the fact that coremaking requirements were limited to around 600 centre cores and 2,400 strainer, or grid cores per day. Raw female labour only was available at the outset, and eventually this was weeded down to four operatives only to produce total requirements, all cores being hand-produced and dried on cast-iron plates. The centre core is rammed up in a cast-iron box split vertically along the centre and is turned out on to a cast plate accommodating three cores. These are dried upside down in relation to their position in the mould, so that any sagging and consequent loss in height is revealed in the top print where it is not important. In order to reduce

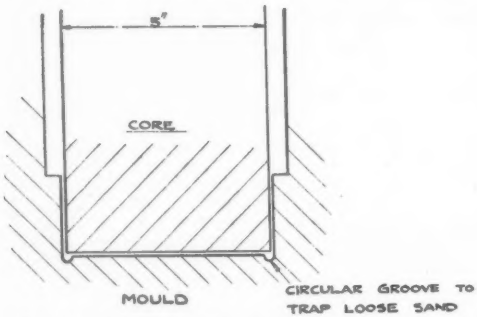


FIG. 13.—SHOWING ADDITION OF GROOVE TO TRAP LOOSE SAND.

this sagging to a minimum, special consideration has been given to the development of a suitable sand mixture, bearing in mind that cores produced must be easy to disintegrate and must have a low hot strength.

This mixture has been standardised at 20 parts reconditioned sand as used in the moulding system plus one part oil-bonded sand, *i.e.*, a 20 per cent. mixture sea sand and oil binder, the whole having a moisture content not exceeding 5 per cent. With this mixture, no support such as iron or wire is necessary, despite the fact that the core is dried on end; neither is manual venting necessary, although a 1-in. dia. hole is tubed out of the centre of the core as a precautionary measure. Strainer or grid cores are made in a 25 per cent. oil sand and are dried in the hottest part of the ovens available, *i.e.*, the top part, in order to ensure complete oxidation and the danger of moisture pick-up in the mould. It will be appreciated that complete oxidation is necessary with moulds which may have to stand for several hours or even overnight before casting.

Core-drying capacity consists of two forced-draft coke-fired battery type ovens, side by side with a common firebox. Green cores are loaded into racks which, when full, are conveyed from the core benches by a hand-operated hydraulic three-wheeled bogie into the ovens. A day's stock of cores is kept in hand at all times as a precaution against eventualities and rigid inspection ensures that all cores are perfect before they are considered as available to the foundry. It may be stated in passing that not more than 2 per cent. of the total cores produced were scrapped as being unfit for use.

Knocking-out Cast-up Boxes

To return from moulding to knocking out cast boxes, it may perhaps be appreciated that this operation, coupled with casting, provided more difficulties than any other operation. The system finally evolved was, however, as follows:—Cast-up boxes are knocked out into hoppers placed at intervals above the knock-out conveyor belt, this belt being some 3 ft. below ground level. These hoppers are located above floor level at a convenient height for handling boxes, the lower section of the hoppers being fitted with baffle plates which ensure that although knocking out may be a spasmodic operation, spent sand is delivered to the belt conveyor in a steady stream. Grids 2 in. square at the top of the conveyor preclude the possibility of large pieces of sprue entering the system and also ensure that spent core sand is broken down into reasonable dimensions, while smaller sprue and tailings are dealt with by the rotary screen and magnetic separator previously described.

Originally the whole of the so-called knock-out belt was open and only covered by 2-in. mesh grids, knocking-out taking place anywhere along its length. This resulted in overloading of the belt and a number of hold ups to clear it. Three types of mechanical jolting machines were tried to reduce knocking-out fatigue. Eventually, however, trestles consisting of two scrap rail sections mounted above the hoppers, with boxes—carried over to these by two operators—each with carrying pins, was found to be the fastest method. It must be appreciated that speed was the essential factor in knocking out, it being necessary in some cases to knock out a total of 200 boxes by hand in 90 min., at the same time placing 200 castings carefully in heaps with only 12 men available. Empty box parts, too, all had to be placed, by hand, on to the return conveyor back to the moulding bays. A number of experiments were carried out to transport boxes, but none of these equalled in speed hand-carrying by knock-out men.

It should be borne in mind, too, that these knock-out men were also, largely due to shortage of labour, the men who did all the casting by hand ladles. It was felt that an average of 200 boxes knocked out per day and 200 boxes cast, each needing two ladles holding 45 lbs. of metal each, by each gang of four men, was no mean effort.

Metal Melting and Distribution

It is considered that some notes on metal melting and distribution may be of interest, although melting is outside the Authors' province and comes under rigid

laboratory control in view of the closeness of the limits of analysis. Air furnaces are used for melting, fired by pulverised coal from an independent high-speed "Attritor" unit. The life of this furnace is usually twelve heats, after which wall repairs are necessary and a new bottom required. These repairs are carried out at the week-end so that the furnace is always available during the working week. Standard capacity for the charge of metal is 18 tons, the slagging sills being raised or lowered to accommodate a minimum of 15 tons or a maximum of 22 tons. Steel trays holding approximately 60 cwts. of metal are used for charging, these being hand-loaded and afterwards picked up by overhead travelling cranes and tipped through the furnace roof. In order to facilitate charging and to economise on roof replacements, the whole of the furnace roof is built up of "bungs," *i.e.*, cast-iron straps holding lightly-bonded firebricks.

Since the weight of metal melted is an estimate of foundry requirements it is arranged that additions of pig-iron and scrap above the minimum of 15 tons are kept handy and available if necessary. Requirements for each heat are chalked up on a charging board fixed in a prominent position near the furnace. Although furnace control during melting is supervised by the laboratory, the amount of metal charged and times of tapping are, of course, decided by the foundry.

An arrangement is in operation whereby metal is shared between the bogie-wheel foundry and a similar melting unit in an adjacent moulding shop. Total metal requirements are three heats per day, thus allowing three batches of metal into the bogie-wheel foundry and generally the shop which is likely to have the greater concentration of moulds, melts two heats, and the other shop melts one; this keeps transport of molten metal down to a minimum. Tapping times are 7.30 a.m., 11.0 a.m., and 4.0 p.m., one hour being allowed for running out each heat, although running-out times, of course, depend on the condition of the metal and number of bogies and casting men available. It was around this arrangement of three heats per day that the cycle of foundry operations was developed.

Tapping and distributing the metal has now become routine, but in the early stages, with comparatively untrained labour, the handling and distributing of so much molten metal in the time allowed by the schedule was a lively task of some speculation. Four tapping holes are located, two on each side of the furnace, the hole being incorporated in a firebrick block; the holes taper from 2 in. down to ¼ in. at the discharge, although these open with wear. Two blocks are located on a level with the furnace bottom and two slightly higher so that, if desired, metal can be drawn from a point nearer the surface of the bath with consequently less pressure. Tapping spouts are channel section and attached to the furnace shell and, being lined with moulding sand, their height is sufficient to allow 5-cwt. capacity two-wheeled bogies to pass under. The tap holes are stopped by means of a tapered oil-sand core rammed into position.

When a furnace is tapped, every effort is made to maintain a continuous stream without bolting up and to empty as quickly as possible. In order to do this a hand-ladle is used to catch the stream between bogies, metal caught in the ladle being poured back into the bogie standing under the stream. Unavoidable splashing occurs while changing bogies, since the force of the stream at the beginning of a tap may be such as to deliver 10 cwts. of metal per min., *i.e.*, to fill a bogie in 30 secs. However, the operators soon become adept at changing bogies, not more than 4 to 5 secs. being necessary for the changeover. A flow of metal at the rate of 1 ton in 3 min. is an average stream and will empty the furnace in the allotted time.

Full bogies are pulled away from the stream to pouring stations situated along the front of casting conveyors, no definite stations being fixed. Casting men in their gangs of four stop bogies where it is most convenient for them to use the metal. Hand ladles are used to convey metal to the moulds, each of which is cast by two hand-ladle men. Each ladle holds approximately 42 to 45 lb. of metal and two of these are poured simultaneously down separate runners, giving an approximate weight of casting,

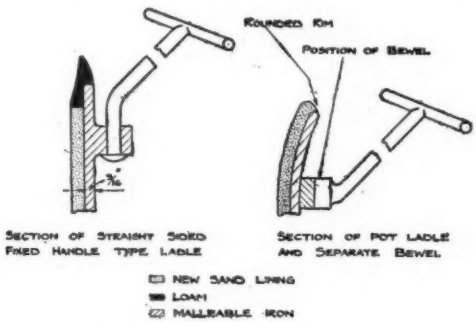


FIG. 14.—DESIGN OF HAND-LADLE.

runners and feeders of 84 lb. As soon as a bogie is empty, it is returned to the furnace for refilling, a full bogie taking its place until the furnace is empty.

For the purpose of getting the requisite number of bogies to each pouring station and into the adjoining foundry a sequence of distribution is decided upon before tapping. It is of interest to note here that these bogies are pre-heated by an economical arrangement whereby a blast of air, delivered from a small fan, is blown into a shovelful of hot cinders placed into the bottom of each bogie. Although these two-wheeled bogies are an excellent means of distributing metal quickly from a continuous stream, it was originally intended to use 5-cwt. capacity ladles travelling on an overhead conveyor, and it is with regret that the pressure of the daily task, even though trials gave high expectations of success, that the Authors have to confess that this means of metal distribution has not been fully developed.

Several estimates were made during the planning stage

Mass Production of Tank Wheels

as to the peak output of this plant, and, although development was a gradual process, these estimates have been eventually surpassed. Contributing in no small measure to this end is the tight control exercised over causes of waste castings. As production began to step up, bringing in its train numerous and varied calls on time and energy, the vexed question of waste castings inevitably came to the front. Daily recordings of waste and the causes thereof, together with the percentage of waste to G.H.C., is a matter of routine. Valuable data are obtained in this way and much waste avoided as a result. However, these records must convey a true picture and, with this in mind, arrangements are made to keep "wasters" separate for daily visual inspection before consigning them as back scrap.

Avoiding Misruns

In view of the short life of white cast iron in the molten state, misrun castings are to be expected, especially when the labour available is largely untrained. Actually, misruns accounted for nearly half of the total foundry scrap. The speed and dexterity with which this metal is handled after it has left the furnace is an important factor in avoiding misruns; seconds saved here and there may result in pouring a good casting instead of a waster. The Authors fully realise this and maintain a constant supervision at the pouring stations.

Attention to detail also helps to reduce this source of scrap. A change in design of hand ladle (Fig. 14) to eliminate skulling at the pouring lip virtually halved the quantity of misrun castings. Another small item which gave beneficial results was a slight alteration in design of pouring basin so as to allow the first splash of metal to fall direct on the first check or strainer core. Special attention is also given to the correct drying of strainer cores to eliminate any risk of moisture pick-up from the green mould. A damp core here will chill and probably freeze the first metal down the runners, resulting in a complete stop up.

Offset Castings

Another source of scrap worthy of mention is offset castings. The means of avoiding this waste is to have suitable equipment and a satisfactory means of register, bearing in mind that in a continuous plant one may have moulds buffering together, and, also the means of box-part location must allow for expansion due to variation in temperature of moulding boxes as they come back to moulding machines. Gravity roller conveyors, especially when placed close to ground level, must be kept clean and free from sand, and to this end easily accessible for cleaning, otherwise they become little better than skids, with consequent rough treatment to the mould.

The top-part moulding box used in this plant had trunnions cast on for the purpose of closing, and these proved very troublesome with regard to offsets, but when hand-closing was adopted, the box parts were reversed, the trunnions then acting as buffers spacing the moulds.

Slag inclusions are another source of scrap, which although not high is ever present. The running of slag-free castings depends on the skill of the pourer in maintaining a head of metal in the pouring basin, and on the resistance of the filter core to withstand erosion during pouring. A heavy cast produces an increase in waste due to slag inclusions because fatigue becomes evident, resulting in slip-shod pouring.

The plant, like many other war-time ventures, has now closed down, and it was with mixed feelings that the Authors watched dwindle to nothing an output built up after so much effort. Although the plant is not particularly elaborate, it has been proved economically sound, and that is the real test of a mechanised plant's usefulness in the future. A point especially worthy of mention here is the adaptability and flexibility of this layout.

Three different jobs could be in production at the same time, using different sizes of moulding boxes if necessary, or the plant could be run at one-third or two-thirds, or full capacity. Or again, production on running jobs could readily be stepped up or down to suit customers' requirements. For to-day the customer demands from the progressive foundry, not a batch delivery soon, but a daily scheduled supply in harmony with the requirements of his assembly lines.

In conclusion, the Authors would like to express their indebtedness to Mr. T. Bryan and Mr. J. Bingley, under whose direction the plant was run, to Mr. H. Greatorex for preparing slides, and to the directors of Ley's Malleable Castings Company, Limited, for permission to publish this Paper.

NEW CATALOGUE

Carbide Tipped Tools. "Prolite Die Maintenance Manual" (1946), is the title of a well-edited brochure just issued by Protolite, Limited, Central House, Upper Woburn Place, London, W.C.1. It describes and illustrates the use of tungsten carbide for the maintenance of dies. It is divided into four sections, of which the third—"Servicing Solid Shaped Dies"—is the most interesting to our readers. The conversion tables which form an index are distinctly useful, as they cover ranges not usually included in works of reference.

Inserted in this publication was a four-page leaflet "Tipped Tools for Woodworking." Apparently it has been found advantageous to use carbide tipped tools for dealing with three-ply wood or hard woods which have been glued. Glue is particularly abrasive and rapidly reduces the life of ordinary tools.

THE WINTER ISSUE of the "Whiting Founder"—the house organ of the Whiting Corporation, of Harvey, Illinois, U.S.A., is mainly devoted to the subject of cupola charging machines. The article covers cone bottom, single-door drop bottom, and over-the-lip buckets, and the Griffin type skip-hoist charger, by clear text and ample illustration.

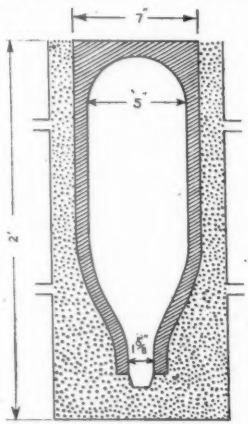
CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CAST-IRON SHELLS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I should like to bring to the notice of your readers the making of cast-iron shells as practised in the early stages of the war. They were being made in a large West Midland foundry. The Government asked for shells of the type indicated on the attached sketch. The firm in question, after making hundreds, failed to solve the simple problem of keeping the core central. If some of your readers would show how it can be done, it would constitute an interesting lesson



BOTTOM END

FIG. A.

for the rising generation. The shells had to withstand 1,000 lb. water pressure. The mould must carry no chaplets or holes other than that indicated on the sketch. The solution is found by a simple method of harnessing a natural law. The method tried was impossible. I shall be pleased to criticise any suggestion and to submit my own.

Yours, etc.,
SAM HUMPHRIES.

135, Mountsteven Avenue,
Paston, Peterborough.
May 23, 1946.

MALLEABLE CASTING CAPACITY

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I was interested to read your excellent *résumé* in the issue of May 16 of the Report on the Iron-foundry Industry. There is just one little point to which I would like to draw attention in connection with the remarks you make in column 2 on page 48, on the British Malleable Tube Fittings Associa-

(Continued at foot of next column.)

DIFFICULTIES IN THE ENGINEERING INDUSTRY

Mr. Isaacs, Minister of Labour and National Service, addressing the annual meeting of the Confederation of Shipbuilding and Engineering Unions, said that re-conversion from munitions to civilian production in this industry had proceeded with less dislocation than might have been expected. There were many difficulties, but the general picture was encouraging and he only mentioned one or two of the present difficulties with which it was concerned.

A serious difficulty which the Ministry was making every effort to help the industry to overcome was the shortage of certain classes of skilled workers, *e.g.*, boiler platers, pattern-makers, moulders, blacksmiths, electricians, railway carriage and wagon builders, wagon repairers. The shortage of these men was holding up the production of essential castings urgently needed at the present time in connection with the housing programme and delaying the provision or rehabilitation of essential rolling stock for the railways.

The shortage of moulders was due to the fact that the foundry industry was one of the industries from which workers were transferred to help in other sections of industry during the war, and in consequence the labour force was seriously depleted. He hoped that, as a result of the steps which were now being taken, the foundries would attract men in the future, and so build up the industry to the labour force required. He was sure he could rely upon the unions to aid the recruitment of men to this essential industry. The recent agreements, for both engineering and light castings foundries, for the training of new entrants to the industry, and the upgrading of existing workers should help considerably in easing labour difficulties.

A HEAVY MACHINE SHOP under construction for the Standard Brass, Iron and Steel Foundry, of Benoni, Transvaal, is nearing completion. It is 150 ft. long by 50 ft. wide and is spanned by a 25-ton overhead electric travelling crane.

(Continued from previous column.)

tion. You say, "there is ample reserve capacity in this highly mechanised section." I think this statement should be amplified a little. It should be stated that the reserve capacity cannot be brought into effect unless the labour situation improves very materially. Attention is in fact drawn to this circumstance on page 80 of the Joint Iron Council's Report on the Iron Industry.

Yours, etc.,
F. B. RIDGWELL,
Secretary.

196, Shaftesbury Avenue,
London, W.C.2.
May 24, 1946.

[We thank Mr. Ridgwell for drawing our attention to this slip. We should have given the suggested amplification.—EDITOR.]

IMPORTS AND EXPORTS OF IRON AND STEEL

BOARD OF TRADE RETURNS FOR APRIL

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in April and in the first four months of 1946. Figures for four months of 1938 are given for purposes of comparison.

Total Exports of Iron and Steel

Destination.	April, 1946.	Four months ended April.	One-third of 1938.
	Tons.	Tons.	Tons.
Eire	6,162	24,154	18,573
Channel Islands	347	1,612	2,472
Palestine	6,131	25,465	2,690
British West Africa	4,136	15,459	16,581
Union of South Africa	13,795	75,302	77,029
Northern Rhodesia	222	1,411	6,858
Southern Rhodesia	1,537	21,710	12,071
British East Africa	1,463	7,692	8,644
British India	6,524	28,082	52,892
Burma	105	4,479	6,171
British Malaya	2,551	10,154	22,195
Ceylon	1,315	3,719	8,677
Hong Kong	1,016	5,655	7,805
Australia	6,298	9,244	56,968
New Zealand	4,420	15,450	43,961
Canada	766	2,201	28,470
British West India Islands	1,442	6,603	14,750
Anglo-Egyptian Sudan	644	3,552	2,763
Other British Countries	1,650	6,929	7,305
Soviet Union	—	—	1,450
Finland	1,974	11,918	5,869
Norway	3,300	25,581	6,758
Iceland	629	2,591	219
Denmark	22,672	71,544	29,085
Poland	3,740	4,494	829
Netherlands	24,278	73,085	17,186
Dutch East Indies	605	605	9,102
Dutch West India Islands	429	4,083	821
Belgium	1,808	12,011	6,775
France	8,138	28,467	4,462
Portugal	5,696	18,480	2,571
Portuguese East Africa	471	1,676	4,740
Spain	1,388	4,491	2,588
Italy	136	217	1,713
Greece	509	3,064	584
Turkey	925	4,534	4,586
Egypt	7,379	39,376	11,470
Iraq	9,110	23,286	8,580
Iran	12,604	40,307	36,793
China	2,043	2,523	7,377
U.S.A.	82	264	729
Venezuela	2,486	8,181	1,558
Ecuador	436	1,042	531
Chile	860	1,743	2,098
Brazil	1,263	16,104	5,663
Uruguay	1,013	2,559	2,529
Argentine	6,218	24,283	26,452
Other Foreign Countries	19,737	67,151	38,571
Total	200,453	762,533	638,625

IRON AND STEEL AND MANUFACTURES were imported by Eire in the first two months of this year to a value of £523,775, as compared with £185,007 in the corresponding period of last year. Among the individual items were:—Cast iron, £4,777, against £2,396; hollowware, £22,597, against £7,512; tanks, cisterns, etc., £6,678, against £821.

Total Imports of Iron and Steel

From	April, 1946.	Four months ended April.	One-third of 1938.
	Tons.	Tons.	Tons.
British India	1,563	8,772	52,878
Australia	527	16,330	12
Canada	14,604	49,269	39,125
Other British Countries	17	66	1,866
Sweden	168	732	29,932
Norway	9	2,072	11,258
Belgium	17	2,041	91,227
Luxemburg	—	—	19,534
France	—	60	85,782
U.S.A.	13,339	49,633	66,897
Other Foreign Countries	175	185	50,580
Total	30,419	129,160	448,090
Iron ore and concentrates—			
Manganiferous	—	6,900	20,761
Other sorts	499,881	1,939,967	1,700,623
Iron and steel, scrap and waste, fit only for the recovery of metal	51,244	136,659	210,734

Exports of Iron and Steel by Products

Product.	April, 1946.	Four months ended April.	One-third of 1938.
	Tons.	Tons.	Tons.
Pig-iron	811	1,263	31,314
Ferro-alloys, etc.—			
Ferro-tungsten	15	159	172
Spiegeleisen and ferro-manganese	5,380	24,059	1,732
All other descriptions*	74	425	349
Ingots, blooms, billets and slabs	148	551	3,248
Iron bars and rods	1,177	4,727	1,066
Sheet and tinplate bars	22	243	4,127
Wire rods and bright steel bars	5,352	14,915	3,256
Other steel bars and rods	20,455	85,810	34,000
Special steel	1,415	4,972	1,644
Angles, shapes and sections	12,827	50,819	22,468
Castings and forgings	278	835	539
Girders, beams, joists and pillars	12,173	36,144	11,157
Hoop and strip	6,783	27,525	12,459
Plates, ⅛ in. thick and over	29,322	109,001	43,653
Black plates	3,452	8,001	4,846
Black sheets	2,405	8,762	21,170
Galvanised sheets	1,693	4,963	48,978
Tinplates	10,305	33,380	106,436
Tinned sheets	450	830	470
Terneplates	66	241	1,442
Decorated tinplates	48	296	1,456
Cast-iron pipes, up to 6-in. dia.	3,359	11,814	16,309
Do., over 6-in. dia.	2,062	9,219	14,321
Wrought-iron tubes	22,750	84,518	73,324
Steel rails	12,440	66,044	35,333
Sleepers and fishplates	5,460	42,233	8,461
Other railway material	1,235	6,116	8,924
Wire	5,836	23,245	18,394
Wire manufactures	2,817	8,729	9,830
Nails, tacks, etc.	580	2,668	1,269
Rivets and washers	641	2,755	2,845
Wood screws	533	1,813	837
Bolts, nuts, and metal screws	1,946	7,126	5,858
Stoves, grates, etc.	365	1,896	3,050
Sanitary cisterns	78	275	937
Fencing material	475	1,350	1,710
Anchors, etc.	554	1,572	2,112
Chains	641	2,653	2,097
Springs	896	2,318	1,310
Hollow-ware	7,813	24,009	3,568
All other manufactures	15,321	44,259	72,153
Total	200,453	762,533	638,625

* The figures for 1946 are not completely comparable with those for earlier years.

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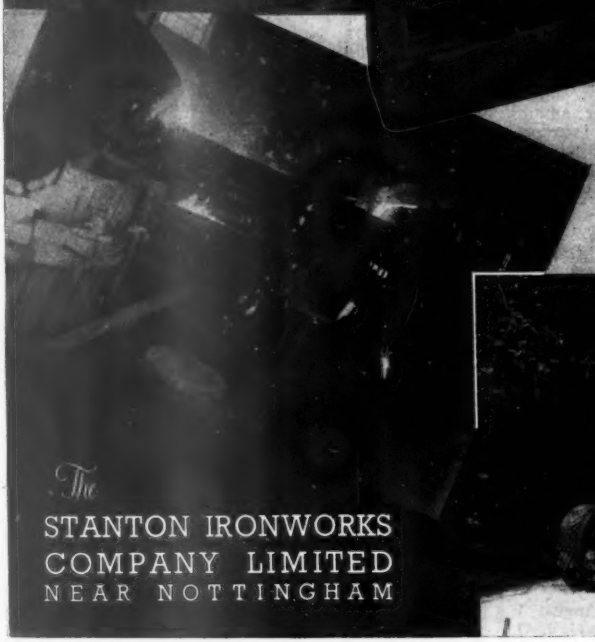
Manufactured to guaranteed analyses in seven standard grades. Also obtainable to individual specification

THE 14-TON CASTING ILLUSTRATED IS ONE OF A SERIES MADE IN A STANTON FOUNDRY FROM STANTON DALE IRON

1. Core being lowered into mould
2. Pouring the metal
3. Finished casting in transit



The
STANTON IRONWORKS
COMPANY LIMITED
NEAR NOTTINGHAM

UNITED STEEL COMPANIES' CONVERSION SCHEME

PREFERENCE SHARES FOR DEBENTURES

The United Steel Companies, Limited, propose to pay off the £2,003,674 4 per cent. debenture stock at 102 and to offer in exchange 1,883,454 4½ per cent. cumulative preference shares of £1 each. This follows the redemption in December last of the £1,500,000 10-year notes by means of an issue of 4½ per cent. preference shares. The reasons for the proposals now announced are:—(*a*) The desire of the board to release the colliery assets at present subject to a charge under the debenture stock trust deed so that these assets may be disposed of to the National Coal Board, now being established, free of any lien or charge; and (*b*) the necessity, so far as the steelworks are concerned, of removing the restrictions on borrowing imposed by the debenture stock trust deed in order to facilitate the financing of the projected extensions, modernisation and new developments within the company.

Debenture holders who decide to exchange will receive 94 preference shares credited as fully paid, amounting at the issue price of 21s. 9d. per share to £102, plus four months' interest of 14s. 8d. (£1 6s. 8d., less tax at 9s.). The offer expires on June 17. Morgan Grenfell & Company have undertaken, in consideration of a commission of 6d. per share on the 1,883,454 preference shares, to subscribe at 21s. 9d. per share for any of the shares not converted.

By the substitution of the preference shares, which will later be converted into stock, for the debenture it will be no longer necessary to provide for annual redemption payments of about £55,000 per annum. It will free the company from all fixed charges in respect of long-term borrowing and will enable the company to finance the development programme by temporary borrowing.

Modernisation and Development

In a statement accompanying details of the scheme, Sir W. Benton Jones, chairman of the company, says that the plans of the company for the future include not only necessary renewals, but also schemes of modernisation and new development which will involve very considerable expenditure. The directors feel that, so far as lies within their power, they must continue to plan for the future as they have in the past. However many points of view there may be, and however strongly they may oppose views contrary to their own, the task and the first duty of the company are to continue to produce and to plan for the future undeterred by any changes which may take place. They believe that in order to carry out to the best of their judgment and ability the plans for the future which they in common with other steelmakers have worked out, the first step to take is to free the assets of the company from its debenture. The scheme has received the sanction of the Capital Issues Committee.

The preference dividend will run from August 1, 1946, and the first payment made on February 1, 1947.

IN PARLIAMENT

Iron and Steel Industry Reconstruction Schemes

Several questions relating to iron and steel industry reconstruction schemes were addressed to the MINISTER OF SUPPLY in the House of Commons last week. Replying to MR. ERROLL, MR. MARTIN LINDSAY and MR. KEELING, the Minister said that 27 schemes, costing nearly £16,000,000, had already been approved and licences issued. A further 20 of the more urgent schemes, costing some £48,000,000, had also been approved, and the firms concerned had been asked to supply the details necessary for the issue of licences. This covered all the urgent schemes which were ready to proceed, including the reconstruction scheme at the Dalzell Works of Colvilles, Limited.

With regard to the reconstruction of the Dalzell Works, the Government were spending millions of pounds, and would they own these steelworks after they had been reconstructed, or was the same thing to happen as happened in the war? asked MR. KIRKWOOD, who posed the further question: "Are the works to revert to the company to be used for profit?"

MR. WILMOT: We shall be dealing with this matter in some detail very shortly. I think it has already been announced that a large part of the main production of steel will be brought under public ownership.

MR. EDEN: Is it not clear that all these schemes are at present to be privately financed?

MR. WILMOT: Not necessarily.

MR. M. LINDSAY said he would like to know what steps the Minister had taken to see that these development plans were now able to proceed in spite of the uncertainty that had been engendered in the industry as a result of the Government statement.

MR. WILMOT said the answer to that question was that they were proceeding, as Mr. Lindsay would find when he read his answer, and as he would notice from several reports that had been issued in recent days by the companies.

Following is the list:—

Colvilles, Limited: New blast furnace at Clyde Iron Works; Dorman, Long & Company, Limited: Ore preparation plant; Guest Keen Baldwins Iron & Steel Company, Limited: Preliminary work on site of new strip mill at Margam (extension of Cornelly quarry to supply limestone to new Margam works); John Lysaght, Limited: Modernisation of sheet mills at Newport; Richard Thomas & Baldwins, Limited: Electrolytic tinning plant at Ebbw Vale; John Summers & Sons, Limited: New melting shop; Stewarts and Lloyds, Limited: Alterations to melting shop at Clydesdale. New tube plant at Mossend. Reconstruction of tube plant at Coatbridge. New melting shop at Corby. Increase in coke ovens at Corby. Extension to research department at Corby. Modernisation of tube plant at Newport; United Steel Companies, Limited: Modernisation of boiler plant at Workington. New melting shop at Appleby-Frodingham. Replacement of cogging and section mills at Appleby-Frodingham; Whitehead Iron & Steel Company, Limited: Improvements to re-rolling plant.

THE MINISTER OF SUPPLY told Col. Lancaster in the House of Commons last week that approximately 100,000 tons of steel production had been lost during the last three months owing to insufficient deliveries of coal.

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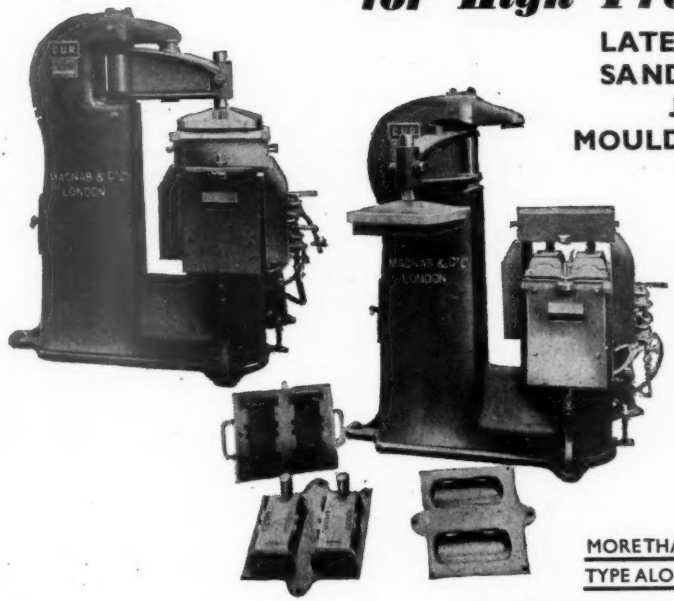
for High Production



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SPECIAL FEATURES:

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NEWS IN BRIEF

A STRIKE OF MOULDERS at the Dock Foundry of the Bo'ness Iron Company, Limited, has been settled.

FODENS, LIMITED, of Sandbach, Ches., manufacturers of heavy vehicles, etc., have produced a film depicting the various stages of manufacture. Included in the film is a view of their foundry, where castings up to 3 tons are manufactured.

THE BRITISH EXPORT TRADE RESEARCH ORGANISATION has opened its first office abroad at Stockholm. An office will be opened in Cairo later in the year, while arrangements have been completed to deal with the Argentine and Indian markets.

MR. W. GARDNER, chairman of Amalgamated Metal Corporation, Limited, in a statement accompanying the annual report, says that the group are broadening the basis of their activities with the object of taking part in the world-wide distribution of raw materials additional to non-ferrous metals and rubber, and also in the distribution of manufactured goods. The constituent companies, Henry Gardner & Company, Limited, and the British Metal Corporation, Limited, are taking joint action to obtain participation in the import and export trade of China.

THE SOUTH AFRICAN GOVERNMENT has issued a White Paper on the proposed increase of £15,000,000 in the share capital of the South African Iron & Steel Industrial Corporation, Limited, for the extension of plant. It is proposed to build a new steel plant at Vereeniging with an ingot capacity of 320,000 to 350,000 tons a year, representing a capacity of 240,000 tons of the various flat-rolled products for which the steel is to be used. The planning will allow a subsequent expansion of up to 1,000,000 tons a year. The Iscor works at Pretoria also are to be extended.

THE BUSINESS OF Brandeis, Goldschmidt & Company, Limited, metal merchants, 9-13, King William Street, London, E.C.4, which was founded in 1873 (a private company), including the American subsidiary of the same name, has been acquired by a group consisting of the Rio Tinto Company, Limited, copper smelters and iron-ore merchants, and S. G. Warburg & Company, Limited, acting on behalf of themselves and of a number of others. A new company has been formed in London under the name of Brandeis, Goldschmidt & Company, with an authorised capital of £500,000.

MR. H. W. DIETERT, of the Harry W. Dietert Company, 9330, Roselawn Avenue, Detroit, 4, Michigan, U.S.A., announces that in order that he might devote his full efforts to sand research, manufacture, sales and service of sand testing, carbon and sulphur determination equipment, he has sold his interest in the sales and service of spectrometric equipment to his associates, the Applied Research Laboratories, of 7707, Michigan Avenue, Detroit, 10, Michigan. The Harry W. Dietert Company will, however, aid the Applied Research Laboratories in the manufacture of a portion of the spectrometric equipment.

J. BROCKHOUSE & COMPANY, LIMITED, spring and axle manufacturers, etc., of West Bromwich, propose to reorganise and increase the capital so that it will be £2,000,000, of which £500,000 will be in 4½ per cent. cumulative preference stock, £902,298 in ordinary stock, both issued and fully paid, and £597,702 unclassified and unissued shares of £1 each. For this purpose it is proposed to convert the existing £25,000 6 per cent. cumulative preference into £20,000 4½ per cent. cumulative preference stock and £5,000 ordinary stock. Meetings to consider the proposals will be held on June 17.

MECHANISATION OF RAINWATER GOODS PRODUCTION

Recommendations for the reorganisation of the iron-founding industry in Scotland have been made by the Forth Valley Industrial Development Council, who recently, under the chairmanship of Capt. H. J. Kennard, a director of the Falkirk Iron Company, Limited, examined the problems confronting the Scottish light-castings industry. The Council stated that recruiting in the industry had shown improvement, but in their opinion it was still necessary that conditions should be so improved as to offer attractive wages and better working conditions. Development of the industry depended entirely upon the scale of recruitment of labour, and this was an important factor at a time when so many alternative materials were being submitted in place of cast-iron goods. It should be definitely known, the Council stated, that apart from rainwater goods, which were difficult in production owing to the fact that the Government had completely closed down this section of the industry during the war, there was no hold-up in the delivery of cast-iron products which was affecting the progress of the housing development. The rate of production of the necessary cast-iron goods was, in fact, ahead of the rate of building progress.

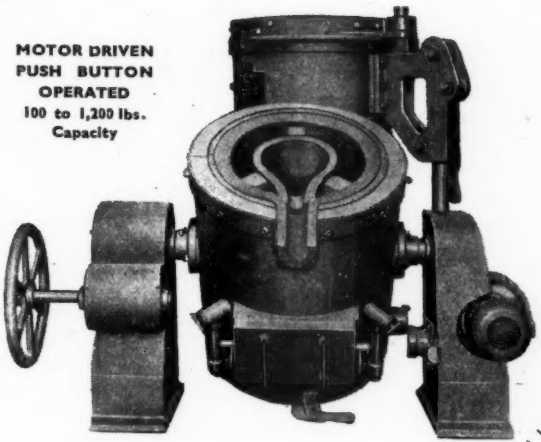
The opinion of the Council was that to achieve increased production additional machinery and machine tools were needed, but that it was not desirable to instal such new plant and equipment in the existing buildings. The utmost difficulty was experienced in obtaining licences to permit of the building of the necessary factory space to house new plant and equipment so essential for the development and continuance of the industry.

The Council suggested that a scheme should be inaugurated whereby the iron moulder was concerned solely with the moulding and casting of his products and that the preparation of his sand and the emptying of his boxes should be the concern of other labour. The Council decided to approach representatives of employers and employees with regard to the proposal for the division of labour in the iron-moulding branch of the industry. The Council also agreed to request the co-operation of the Under-Secretary of State for Scotland in securing the more rapid issue of licences for the improving of factory buildings or the erection of new buildings to house the plant considered necessary to increase the production of the light-castings industry.

CRUCIBLE FURNACES FOR NON-FERROUS METALS

"POLFORD" REGISTERED

RAPID MELTING HOPPER ACTS AS PRE-HEATER GAS, COKE OR OIL FIRED
100 to 250 lbs. Capacity



MOTOR DRIVEN PUSH BUTTON OPERATED
100 to 1,200 lbs. Capacity

FLEXIBILITY OF CONTROL * LOW FUEL CONSUMPTION

SOLE AGENTS

THOS. W. WARD, LIMITED. Albion Works, Sheffield
TELEPHONE: 26311 TELEGRAMS: FORWARD SHEFFIELD

COMPANY RESULTS

(Figures for previous year in brackets.)

Veritys—Interim dividend of 7½% (same).

Mason & Burns—Dividend of 5% (same).

Inbucon—Final dividend of 6%, making 8% (same).

E. G. Brown & Company—Interim dividend of 10% (same).

Fricker's Metal & Chemical—Dividend of 6% (same).

National Electric Construction—Dividend of 10% (same).

Steel Ceilings—Loss for 1945, £6,074 (net profit £4,429).

Brooke Tool Manufacturing—Interim dividend of 5% (7½%).

F. Francis & Sons—Final dividend of 11% (10%), making 15% (14%).

Burntisland Shipbuilding—Final dividend of 15% (10%), making 20% (15%).

Summerlee Iron—Loss to February 28, £41,482 (£16,867); forward debit, £12,625 (£28,857).

Kitchen & Wade—Second interim dividend of 12½% (same), making 25% to date (25% for year).

Meters—Net profit to March 31, £13,976 (£28,126); dividend of 10% (same); forward, £13,048 (£13,456).

Allied Ironfounders (Ireland)—Dividend on 6% cumulative preference shares for the year to June 30, 1944.

Vactric—Dividend for half-year ended March 31 last on the 6% cumulative preference shares is being deferred.

Enfield Rolling Mills—Net profit for 1945, £23,692 (£12,399); dividend of 5% (same); forward, £129,749 (£121,457).

Sidney Flavel & Company—Net profit for 1945, £28,979 (£24,889); dividend of 22½% (25%, and bonus of 5%); forward, £17,070 (£16,841).

Amalgamated Metal Corporation—Net profit for the year ended March 31, £211,013 (£210,814); dividend of 3½% (same); forward, £45,805 (£44,045).

London Electric Wire Company & Smiths—Final dividend of 5½%, making 7½% (same), and interim dividend (in respect of 1946) of 2% (same).

Newton Chambers—Net profit for 1945, £99,350 (£99,490); notes repayment reserve, £30,000 (same); final dividend of 10%, making 15% (same); forward, £171,306 (£150,989).

British Roll Makers Corporation—Dividends from subsidiary companies for 1945, £36,901 (£36,482); E.P.T. overprovided for 1944, £15,000 (nil); dividend of 15% (same); forward, £28,046 (£26,289).

Trussed Concrete Steel—Trading loss for 1945, after depreciation, £45,758 (net profit, £13,759); preference dividend for half-year to September 29, £750 (one year £1,500); no ordinary dividend (5%); forward, £12,344 (£852).

Allen West & Company—Net profit for the year ended January 31, after crediting £16,000 (nil) estimated net E.P.T. recovery, £47,771 (£50,197); dividend of 7½% (same); to general reserve, £15,000 (same); forward, £56,947 (£60,738).

Colvilles—Trading profit, after taxation and contingencies for 1945, £564,235 (£537,199); net dividends from subsidiaries. £86,438 (£94,212); depreciation and obsolescence, £350,000 (same); final dividend of 5%, making 8% (same); forward, £397,809 (£320,217).

Johnson & Phillips—Profit, after maintenance. for 1945, £313,007 (£458,296); tax provision, £58,000 (£180,000); A.R.P. expenditure, £824 (£20,698); net profit, £162,821 (£180,325); to reserves, £107,500 (£105,000); final dividend of 7½%, making 15% (same); forward, £112,825 (£84,432).

John Summers & Sons—Net profit for 1945, before tax, £856,754 (£878,718); net profit, after tax, £456,754 (£428,718); to general reserve, £195,000 (£150,000); to contingencies, nil (£50,000); ordinary dividend of 8½% (8½% on "A" ordinary and 4½% on "B" ordinary); forward, £208,968 (£201,864).

W. Canning & Company—Net profit for 1945, £127,145 (£166,597); to general reserve, £10,000 (£15,000); final dividend of 5% and bonus of 2s. 6d. per share; to employees' benevolent trust fund, £5,000 (same); to Birmingham University developments fund, nil (£10,000); forward, £66,380 (£56,554).

Baker Perkins—Net profit for the year ended December 25, £146,687 (£119,109); final dividend of 10% (equal to 12.8% on the old capital), making, with the interim dividend of 4% paid on the old capital, 14% (against 5½%, making 9%); to general reserve, £25,000 (same); to pensions reserve, £5,000 (£2,500); forward, £169.795 (£146,805).

EALING PARK FOUNDRY

Employees of Ealing Park Foundry, Limited, South Ealing, London, W.5, were the guests of the directorate at a smoking concert at Ealing Town Hall, on May 23. One of the objects was to enable the staff to meet the directors of Qualcast, Limited, as this company are now the proprietors of the London concern. Mr. R. B. Templeton, managing director of Ealing Park Foundry, Limited, proposing the health of the directors of the parent company, referred to the harmonious relationship which had existed between the management and the men ever since he joined the company 15 years ago. Mr. V. Jobson, in reply, emphasised that there would be no changes in either the policy or the conduct of Ealing Park Foundry. He stressed that he was looking to the younger men in the group to fill the highest positions in the direction of the group's affairs. Technological interests were represented by Mr. V. C. Faulkner, past-president of the Institute of British Foundrymen, and Mr. F. Arnold Wilson, hon. secretary of the London branch of the Institute.

THE GLANMOR FOUNDRY COMPANY, LIMITED, Llanelly, have been asked to postpone the tendering of notices to their employees from June 1 to June 15 following negotiations between representatives of the company and Government departments. The question of Government assistance for the company is likely to be decided within the next week or two.

STRICT G.R.

MANUFACTURING CONTROL

CONSISTENT porosity values are maintained at all "G.R." works within very narrow limits by controlling the quality of raw materials, gradings, tempering, pressing and firing. Porosity tests are one of several applied regularly throughout the daily manufacturing schedule. They provide tangible evidence of the maintenance of those highly prized characteristics of G.R. products—reliability and length of service. "G.R." engineers are available for advice on the choice and application of refractories and are at the service of executives in all industries using refractories.

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ACID-RESISTING MATERIALS
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AND HIGH ALUMINA BRICKS
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REFRACTORY CEMENTS · SANDS
187

GENERAL REFRACTORIES
LIMITED
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Raw Material Markets

IRON AND STEEL

Buyers' interest in all classes of iron and steel is unimpaired. The continuous, though gradual, upward trend of pig-iron production has enabled blast-furnacemen to keep pace with the more immediate needs of the foundries. There is, in fact, no shortage of hematite and other special irons, although supplies are not excessive. Licence applications from the light foundries, however, embrace bigger tonnages of No. 3 iron than are at present available and some pruning of the allocations is still necessary.

All foundries are anxious for more scrap, but the light foundries are particularly short of light and medium cast-iron scrap. In addition to cast-iron scrap the general engineering foundries want steel and heavy machinery cast scrap. They also use ferro-alloys, such as ferro-manganese, and ferro-silicon, of which supplies are ample. Other foundry supplies, such as limestone, ganister and firebricks, can be obtained at reasonable notice.

The heaviest demand for steel semis emanates from the sheet mills, whose requirements are still adequately catered for. Deliveries of prime sheet bars are coming forward with such regularity that seconds do not attract much interest. The billet position is also somewhat easier, but re-rollers have still a considerable volume of orders for small and special sections to execute, and they are taking up all the crops and defectives which come on to the market.

Steel plates, chiefly of the lighter denominations, figure conspicuously in the steelmakers' output statistics. The demand both from British industries and from overseas is still increasing, and new orders placed now have not much chance of execution earlier than late August or September. Bookings for heavy and light sections are only slightly less formidable, while the rail mills are assured of continuous employment for many months to come.

NON-FERROUS METALS

When Capt. Marsden asked the Minister of Supply in the House of Commons last week if he was now in a position to announce the decision of the Government in relation to the resumption of free trading in metals, Mr. Wilmot said that the future long-term arrangements for marketing these metals were under consideration. Meanwhile, in view of the present world supply position and other factors, it would be necessary to continue for some time the existing arrangements for Government purchase of the main non-ferrous metals.

Restrictions on the consumption of lead has intensified the demand for copper and copper alloy products, particularly for building requirements, with the result that export trade in copper is being hampered.

The British Non-ferrous Metals Federation announces that the gross output of castings and miscellaneous unalloyed copper products in April was 500 tons; output of castings and miscellaneous products was 4,600 tons.

There has been no official announcement as yet about a new ceiling price for domestic copper on the other side of the Atlantic, but the latest intimation from New York suggests that the Office of Price Administration is to abandon its "two bank" scheme for a domestic copper price and is expected to announce a new ceiling price of 14⅜ cents per lb., as against the existing ceiling of 12 cents. The new price will, it is believed, include those mines now shut down pending a settlement of wage negotiations. The "two bank" system of price increases provides for one price level for firms that have made wage adjustments and a second for firms with wage adjustments pending.

PERSONAL

MR. E. R. JONES, who retired recently from the position of managing director of Jones & Attwood, Limited, heating engineers, ironfounders, etc., of Stourbridge, has received a presentation from the employees.

MR. JOHN GEORGE ALLEN, commercial manager, and MR. JOHN EDWARD MERCER, foundry manager, of the steel foundries of Head, Wrightson & Company, Limited, have been appointed directors of the Stockton Steel Foundry Company, Limited, a subsidiary company.

MR. GUY F. DOWDING has resigned his directorship of Tata, Limited, of London, in which capacity he represented the Tata Iron & Steel Company, Limited, of Bombay, for the past 10 years. During the whole of the war period Mr. Dowding was, at his request, seconded by the Tata Company to Government service. He was first appointed Assistant Controller of Machine Tools in 1939, and subsequently served as technical adviser on a number of committees in the War Cabinet office and latterly in the Ministry of Production.

Will

BUDD, SIR CECIL LINDSAY, metal merchant, chairman of the London Metal Exchange from 1902 to 1928... £216,473

OBITUARY

SIR CHARLES MARSTON, who died at Stratford-on-Avon on May 21, was chairman of the Villiers Engineering Company, Limited.

MR. FRANK E. SAMPSON, chairman and managing director of H. Sampson & Sons, Limited, engineers and ironfounders, of Bristol, died on May 21 after a short illness.

MR. GERALD WEBB, whose death at the age of 60 is announced, was employment and personnel manager with Mather & Platt, Limited, electrical and textile engineers, etc., Manchester, with whom he had been associated for 34 years. He was for 20 years secretary of the Manchester Engineering Council.

OWING TO INCREASES made by the Ministry of Food through the Starch and Dextrine Control, the price of raw materials has increased sharply, with the result that prices of high-grade ore compounds have consequently risen.